United States
Department of
Agriculture

Agricultural
Research
Service

Production
Research Report
Number 183

Evaluation of Chemical Products Against Selected Pests of Greenhouse and Outdoor Ornamental Crops, 1977-1982

ABSTRACT

Neal, John W., Jr., Dana R. Pillit, James E. Koch, and Larry W. Douglass. 1984. Evaluation of chemical products against selected pests of greenhouse and outdoor ornamental crops, 1977-1982. U.S. Department of Agriculture Production Research Report No. 183, 56 pp.

The domestic wholesale value of major floriculture crops, including bedding plants, flowers, and foliage, was valued at $1.02 billion in 1981. This does not include the gigantic landscape nursery business. Millions of dollars are lost annually because of direct damage by pests as well as the cost of their control. Due to registration problems, pesticide resistance, product withdrawals, and cancellations, new chemical products with promising characteristics must be evaluated relative to the ornamentals industry standards.

Evaluation of 51 new and established chemical products from 22 companies against selected pests of greenhouse and outdoor ornamental crops in 92 tests is reported. Products were tested against the citrus mealybug on coleus, the waxplant, philodendron, and on coleus with systemics at the time of planting; against the green peach aphid on chrysanthemum, the greenhouse whitefly on tomato, the euonymus scale on euonymus and pachysandra; against the vegetable leafminer on lima bean and snapdragon, the omnivorous leafroller on chrysanthemum, and the twospotted and carmine spider mites on lima bean.

KEYWORDS: Citrus mealybug, euonymus scale, greenhouse whitefly, green peach aphid, omnivorous leafminer, pesticide evaluation, twospotted and carmine spider mites, vegetable leafminer.

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Issued August 1984

Evaluation of Chemical Products Against Selected Pests of Greenhouse and Outdoor Ornamental Crops, 1977-1982

by John W. Neal, Jr., Dana R. Pillit, James E. Koch, and Larry W. Douglass[1/]

Successful commercial production of flowers and foliage plants is continuously subject to invasion and rapid colonization by pests because of the specialized requirements and growing conditions of amenity plant crops. Increased production costs due to energy requirements, the minimum wage law, and extensive foreign imports have seriously reduced the net gains and the competitive edge of the American greenhouse industry. This situation is further confounded when growers of plants demanded by consumers to be blemish free are faced with cancellation and withdrawals of relied-upon products. These growers are also challenged by the potential phytotoxic response of successful new cultivars to alternative chemicals and increasing pest resistance to registered products. The most serious dilemma for growers occurs when commercially available products known to be effective against certain pests cannot be used because they simply are not registered.

This report presents test results conducted at the Agricultural Research Center, Beltsville, Md., from 1977 to 1982. These results include those new materials not held in confidence, reevaluation of many chemicals frequently used in the trade, and such unusual materials as Chokem and Exhalt 800. Chemical products were evaluated against such high priority pests as the citrus mealybug (Planococcus citri (Risso)), green peach aphid (Myzus persicae (Sulzer)), greenhouse whitefly (Trialeurodes vaporariorum (Westwood)), vegetable leafminer (Liriomyza sativae Blanchard), twospotted spider mite (Tetranychus urticae Koch), and carmine spider mite (Tetranychus cinnabarinus (Boisduval)). Some of these tests conducted during the 5-year period were financially supported by the USDA IR-4 Minor Use Registration Program.

METHODS

The test method is given for each pest species or specific product use, such as spray coverage, side dressing, or soil incorporation at transplanting. Individual methods are included because of specific differences in test procedures that occur between pest species. Well-known alternate host plants were used for some ornamental pests. Such plants as tomato and lima bean served as hosts because of very low pest natural mortality on these plants as well as ease of handling and protection.

Mean values in all tests were subjected to an analysis of variance. Significance was separated by Duncan's New Multiple Range test with comparisons at the 5-percent level. Therefore any two means for a test not followed by the same letter are significant at the 5-percent level. Some test data tended to be from a contagious distribution and were transformed to logarithms to the base of 10 (X+1) before submittal to the hierarchial analyses of variance. A value of one was added to each mean before taking logs to avoid a negative log. Tables with treated data are indicated by an asterisk (*) after the table or test number. The mean values for these tests prior to subjecting

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1/ Respectively, research entomologist, Florist and Nursery Crops Laboratory, support scientist (transferred to Environmental Protection Agency, Washington, D.C.), biometrician (retired), formerly Field Crops Laboratory, all Beltsville Agricultural Research Center, Beltsville, Md. 20705, and consultant statistician, University of Maryland, College Park 20740.

the data to logarithms are given in Appendix II. Tabulated data show original counts unless presented as percent mortality.

The following abbreviations are used in the tables: AI=active ingredient, E=emulsifiable, EC=emulsifiable concentrate, FM=flowable microencapsulated, G=granular, L=liquid, LS=liquid solution, NA=not applicable, SC=soluble concentrate, SP=soluble powder, and WP=wettable powder.

Factors that may affect test conditions were soil type or mixture, ambient air temperatures during the test, plant maintenance, height, and condition, and phytotoxicity symptoms. Other factors were provided in an expanded test report to the cooperators who requested product evaluation.

Both user and scientist realize that many variables affect the performance of a pesticide at a given time. Some pesticides are extremely reliable; although others provide consistent results, they may not 'perform' under a given set of conditions at a given time--something we do not understand. Many products reported here were in an early formulation stage, which may contribute to differing results obtained by other scientists. Variables inherent in small tests were the size and general condition of the pest population, plant age and condition, and human and experimental error.

TEST RESULTS

Citrus Mealybug (Planococcus citri (Risso))

Host: Coleus (Coleus blumei Benth. cv. Lord Falmouth). Thirty- to forty-six-cm tall, single-stem coleus plants greenhouse grown in 10.15-cm pots were infested with citrus mealybugs by overlaying cuttings of heavily infested coleus stock plants from a greenhouse-maintained colony. Two weeks were allowed for transfer and population buildup. Three to five plants were sprayed per treatment. Entire plant counts of stems, petioles, and leaves had been made in earlier tests, but this method was later discontinued in favor of random sampling of entire leaves at postspray. Observed mealybugs were categorized in some tests as small nymphs, large nymphs, and adults. Numbers given are live insects present or percent mortality.

Products effective against mealybugs in one or more tests: Ficam W, Imidan, Sumithion, Diazinon AG 500, Knox out, Dursban, Metasystox R, Dylox and Metasystox R, Vydate, Temik, FMC 35001, M 9580, Malathion, and SD 52618.

Table 1*.--Tests to control citrus mealybugs on coleus with selected chemicals evaluated at 4- and 7-day postsprays based on mean number of live insects

Treatment	Formulation	Rate of application		Prespray			4-day postspray			7-day postspray		
		Ml (g)/ gal	Lb AI/ 100 gal	Small nymphs	Large nymphs	Adults	Small nymphs	Large nymphs	Adults	Small nymphs	Large nymphs	Adults
Test 1												
SD 43775----------	2.4 EC	3.15	0.2	2.39 ab	1.24 ab	0.85 a	1.77 abc	1.27 bc	1.07 ab	1.67 abc	1.51 ab	1.38 ab
ABG-6070----------	4.0 EC	1.89	.2	2.46 ab	1.18 ab	.89 a	2.12 ab	1.57 b	1.27 ab	1.91 ab	2.02 a	1.47 ab
FMC 33297---------	3.2 EC	2.36	.2	2.63 a	.87 b	.90 a	.95 cd	1.12 c	.79 b	1.01 bcd	1.39 ab	.97 b
Ficam W----------	76 WP	22.72	3.8	2.31 b	1.41 ab	1.24 a	.74 d	.69 d	.66 b	.10 d	.44 c	.87 b
Imidan-----------	1.0 EC	28.38	.75	2.39 ab	1.30 ab	.89 a	1.48 bcd	1.14 c	.93 ab	.79 cd	1.04 bc	1.17 b
Untreated---------	---	---	---	2.36.ab	1.67 a	1.19 a	2.45 a	1.96 a	1.54 a	2.50 a	1.91 a	1.89 a
Test 2												
PP 557-----------	2.0 EC	2.30	.125	2.46 a	1.50 a	.87 a	1.43 ab	1.42 b	1.23 a	1.65 bc	1.02 b	1.17 b
Sumithion---------	8.0 EC	4.73	1.0	2.41 a	1.50 a	1.08 a	.25 c	.15 d	.72 b	.94 d	.00 d	.41 d
Dylox-------------	4.0 LS	14.20	1.5	2.36 a	1.36 a	.83 a	1.84 ab	1.32 b	.94 ab	1.85 b	1.24 b	.92 bc
Metasystox R------	2.0 SC	7.50	.4	2.70 a	1.43 a	.79 a	.94 bc	.31 cd	.54 b	1.20 cd	.20 cd	.59 cd
Dylox-------------	1.5 SC	28.40	1.125	2.45 a	1.62 a	.90 a	.47 c	.64 c	.46 b	1.26 cd	.48 c	.35 d
Metasystox R------	.5 EC		.38									
Untreated---------	---	---	---	2.42 a	1.72 a	.96 a	2.19 a	2.00 a	1.36 a	2.41 a	1.78 a	1.67 a

Table 2*.--Test to control citrus mealybugs on coleus with selected chemicals evaluated at 5- and 9-day postsprays based on mean number of live insects

Treatment	Formulation	Rate of application		Prespray			5-day postspray			9-day postspray		
		Ml (g)/ gal	Lb AI/ 100 gal	Small nymphs	Large nymphs	Adults	Small nymphs	Large nymphs	Adults	Small nymphs	Large nymphs	Adults
Diazinon AG 500----	4.0 EC	5.00	0.53	2.41 a	1.50 a	1.52 a	1.51 b	0.82 cd	1.06 b	2.01 a	0.81 c	0.68 c
ABG-6070----------	4.0 EC	1.89	.20	2.39 a	1.71 a	1.51 a	2.29 a	1.85 ab	1.38 ab	2.35 a	1.60 ab	1.62 b
A-47171-----------	2.0 EC	37.84	2.00	2.33 a	1.59 a	1.63 a	2.13 ab	1.54 b	1.48 ab	2.32 a	.95 bc	1.49 b
Ficam W----------	76 WP	22.72	3.80	2.27 a	1.63 a	1.61 a	.20 c	.49 d	.30 c	.00 b	.10 d	.10 d
Imidan-----------	1.0 EC	28.38	.75	2.39 a	1.79 a	1.65 a	.65 c	.91 c	1.43 ab	.44 b	.35 cd	.95 c
Untreated---------	---	---	---	2.50 a	1.94 a	1.66 a	2.26 a	2.11 a	1.84 a	2.29 a	1.87 a	2.19 a

Table 3*.--Tests to control citrus mealybugs on coleus with selected chemicals evaluated at 6-day postspray based on mean number of live insects

Treatment	Formulation	Rate of application		Prespray			6-day postspray		
				Small nymphs	Large nymphs	Adults	Small nymphs	Large nymphs	Adults
		Ml (g)/ gal	Lb AI/ 100 gal						
Test 1									
Diazinon AG 500----	4.0 EC	5.00	0.53	2.32 bc	1.83 a	1.37 a	1.42 b	1.03 b	0.64 b
Knox out----------	2.0 FM	30.00	1.59	2.19 c	1.89 a	1.43 a	1.99 ab	1.67 a	1.54 a
Plictran----------	50 WP	.75	.08	2.48 ab	1.77 a	1.66 a	2.39 a	1.73 a	1.69 a
Aqueous pyrenone garden spray------	---	15.00	NA	2.38 ab	1.80 a	1.52 a	1.96 ab	1.75 a	1.57 a
Untreated----------	---	---	---	2.53 a	1.86 a	1.66 a	2.48 a	1.79 a	1.73 a
Test 2									
Chokem------------	---SC	105.00	NA	2.35 a	1.66 a	1.50 a	2.31 b	1.79 a	1.69 a
Dursban-----------	4.0 EC	2.37	.25	2.84 a	1.52 a	1.56 a	.80 c	.00 c	.72 b
Malathion----------	50 EC	15.00	1.74	2.67 a	1.46 a	1.43 a	1.68 b	.64 b	1.06 b
Untreated----------	---	---	---	2.73 a	1.67 a	1.58 a	3.12 a	1.96 a	1.76 a

Table 4*.--Test to control citrus mealybugs on coleus with selected chemicals evaluated at 3-day postspray based on mean number of live insects

Treatment	Formulation	Rate of application		Prespray			3-day postspray		
				Small nymphs	Large nymphs	Adults	Small nymphs	Large nymphs	Adults
		Ml (g)/ gal	Lb AI/ 100 gal						
Diazinon AG 500----	4.0 EC	5.00	0.53	2.43 a	2.12 a	1.76 a	1.71 ab	1.70 ab	1.75 b
Knox out----------	2.0 FM	30.00	1.59	2.33 a	2.29 a	1.69 a	1.32 b	1.59 b	1.62 b
Plictran----------	50 WP	1.00	.11	2.24 a	1.94 a	1.34 b	1.91 ab	2.05 ab	1.45 b
Aqueous pyrenone garden spray------	---	15.00	NA	2.53 a	1.93 a	1.29 b	2.21 ab	1.95 ab	1.50 b
Untreated----------	---	---	---	2.44 a	2.20 a	1.85 a	2.55 a	2.20 a	2.16 a

Table 5*.--Test to control citrus mealybugs on coleus with selected chemicals evaluated at 4-day postspray based on mean number of live insects

Treatment	Formulation	Rate of application		Prespray			4-day postspray		
				Small nymphs	Large nymphs	Adults	Small nymphs	Large nymphs	Adults
		Ml (g)/ gal	Lb AI/ 100 gal						
SD 43775----------	2.4 EC	15.77	1.00	2.58 a	1.42 a	0.40 a	1.94 a	1.26 a	0.77 a
PP 557----------	2.0 EC	2.30	.125	2.64 a	1.44 a	.46 a	1.77 a	1.40 a	.72 a
Sumithion----------	8.0 EC	4.75	1.00	2.79 a	1.22 a	.49 a	.20 b	.10 b	.39 a

Table 6*.--Test to control citrus mealybugs on coleus with selected chemicals evaluated at 7-day postspray based on mean number of live insects

Treatment	Formulation	Rate of application		Prespray			7-day postspray		
				Small nymphs	Large nymphs	Adults	Small nymphs	Large nymphs	Adults
		Ml (g)/ gal	Lb AI/ 100 gal						
Pirimor----------	50 WP	2.27	0.25	2.50 a	1.39 ab	0.96 a	1.86 b	1.80 a	1.32 a
Imidan----------	1.0 EC	28.38	.75	2.50 a	1.39 ab	.96 a	2.21 ab	1.66 ab	1.17 a
Dylox----------	4.0 LS	15.0	1.60	2.55 a	.89 ab	.35 bc	2.03 ab	1.22 bc	.76 ab
Metasystox R------	2.0 SC	7.50	.40	2.72 a	1.11 ab	.66 ab	1.55 b	.90 c	.35 b
Dylox----------	1.5 SC	30.0	1.20	2.58 a	1.43 a	.70 ab	1.64 b	.74 c	.57 b
Metasystox R------	.5 SC		.40						
Untreated---------	---	---	---	2.59 a	.67 b	.15 c	2.52 a	1.21 bc	.54 b

Table 7.--Test to control citrus mealybugs on coleus with selected chemicals evaluated at 9-day postspray based on mean percent mortality

Treatment	Formulation	Rate of application		Mortality
		Ml (g)/ gal	Lb AI/ 100 gal	
Diazinon AG 500------	4.0 EC	4.73	0.50	18.5 d
		2.37	.25	6.1 ef
Knox out----------	2.0 FM	9.46	.50	3.3 f
		4.73	.25	1.1 f
Orthene----------	75 SP	3.03	.50	36.1 c
		1.51	.25	15.3 de
Temik----------	10 G	---	1/5.00	80.5 b
			1/10.00	35.9 c
Vydate----------	2.0 L	9.46	.50	93.6 a
		4.73	.50	78.3 b
Untreated----------	---	---	---	.8 f

1/ Applied as pounds of AI/acre.

Table 8.--Tests to evaluate selected chemicals against citrus mealybug nymphs and adults on coleus at 7-day postspray based on mean percent mortality

Treatment	Formulation	Rate of application		Mortality		
				Young nymphs	Older nymphs	Adults
Test 1		Ml (g)/ gal	Lb AI/ 100 gal			
FMC 35001-------	4.0 EC	1.18	0.125	83.4 a	47.8 a	27.9 b
		2.37	.25	91.2 a	62.1 a	60.0 a
Untreated-------	---	---	---	1.6 b	3.7 b	5.6 b
Test 2						
FMC 35001-------	4.0 EC	1.18	.125	72.0 c	41.4 b	15.5 c
		2.37	.25	87.1 b	55.7 b	33.0 b
Malathion-------	4.4 EC[1/]	15.00	1.70	98.0 a	98.9 a	98.0 a
Untreated-------	---	---	---	5.5 d	5.6 c	4.9 c
Test 3						
M 9580----------	2.0 EC	9.84	.52	99.1 a	99.0 a	96.6 a
		32.37	1.71	99.8 a	99.7 a	100.0 a
Malathion-------	4.4 EC[1/]	14.78	1.71	99.5 a	98.9 a	87.5 a
Diazinon AG 500-	---	4.92	.52	98.8 a	94.8 a	53.3 b
Untreated-------	---	---	---	16.9 b	7.3 b	5.6 b
Test 4						
Pramex----------	1.0 EC	5.0	.125	81.6 b	54.8 b	---
		10.0	.25	83.8 ab	61.2 b	---
		20.0	.50	92.8 a	90.8 a	---
Untreated-------	---	---	---	1.8 c	1.9 c	---
Test 5						
Pramex + PBO----	1.0-4.0 EC	2.5	.0625	67.4 b	34.0 c	---
		5.0	.125	86.6 a	64.6 b	---
		10.0	.25	90.2 a	88.1 a	---
Untreated-------	---	---	---	1.8 c	1.9 d	---
Test 6						
Pramex DX spray-	---	15.0	NA	67.4 b	49.4 b	---
		30.0	NA	73.4 ab	55.2 b	---
		60.0	NA	96.6 a	90.4 a	---
Untreated-------	---	---	---	1.8 c	1.9 c	---
Test 7						
Pydrin----------	2.0 EC	1.2	.06	8.54 c	4.62 c	2.98 b
		2.4	.12	31.08 b	22.62 b	5.08 b
Permethrin------	2.0 EC	1.2	.06	27.96 b	14.98 c	5.74 b
Malathion-------	4.4 EC[1/]	15.0	1.74	93.62 a	85.04 a	25.77 a
Untreated-------	---	---	---	9.74 c	8.39 c	4.77 b

1/ 50 percent spray.

Table 9.--Tests to evaluate selected chemicals against citrus mealybug nymphs and females on coleus at 7- and 8-day postsprays based on mean percent mortality

Treatment	Formulation	Rate of application: Ml (g)/gal	Rate of application: Lb AI/100 gal	Insects per plant	Mortality: Young nymphs	Mortality: Older nymphs	Mortality: Adult females
			7-day postspray				
SD 52618---------	85 WP	1.34	0.25	610	93.05 a	89.60 a	53.21 b
		2.67	.50	605	99.12 a	93.82 a	61.98 b
		5.34	1.00	666	97.75 a	97.27 a	90.33 a
Malathion--------	4.4 EC[1/]	15.00	1.74	688	88.20 a	67.23 b	51.45 b
Diazinon AG 500--	---	4.73	.50	930	62.74 b	52.81 c	25.31 c
Untreated--------	---	---	---	826	3.41 c	3.37 d	4.44 d
			8-day postspray				
Danitol----------	2.4 EC	.79	.05	394	6.30 c	4.60 d	2.49 b
		1.58	.10	434	12.34 c	8.79 d	2.48 b
		3.15	.20	510	18.34 c	11.87 c	1.78 b
Malathion--------	4.4 EC[1/]	15.00	1.74	808	81.39 a	81.84 a	22.76 a
Diazinon AG 500--	---	4.73	.50	573	38.20 b	21.13 b	5.18 b
Untreated--------	---	---	---	517	2.42 c	1.70 d	1.10 b

1/ 50 percent spray.

Host: Waxplant (Hoya carnosa (L. f.) R. Br.). Waxplants approximately 6.5 cm in height in 10.15-cm pots were infested by the same method as for coleus. Treatments were made at 2 rates each to individual groups of 10 plants; 1 group of 10 plants remained untreated. The spray date was sunny with air temperatures of 26.7° to 30.6°C during application. Temik was applied at the preweighed appropriate dosage per pot per acre equivalent. Granules were mixed with the top 0.15 cm of soil followed by watering. Sprayed plants were counted at 14-day posttreatment. Those treated with Temik 10 G were observed at 30-day posttreatment.

Host: Philodendron (Philodendron oxycardium Schott). Philodendron plants approximately 6.5 cm in length in 10.15-cm pots were infested by the same method as for coleus. Treatments were made at 2 rates each to individual groups of 10 plants; 1 group of 10 plants remained untreated. The spray date was clear and sunny with air temperatures of 28.9° to 30.0°C during application. Treated plants were placed in a shaded greenhouse for 5 days prior to examination. Temik was applied at the preweighed appropriate dosage per pot per acre equivalent. Granules were mixed with the top 0.15 cm of soil followed by watering. Plants treated with Temik 10 G were observed at 30-day posttreatment. The method of counting for both sprayed and soil-treated plants required examining six leaves and associated nodes per plant.

Products effective against citrus mealybugs on waxplant: Vydate; on philodendron: Diazinon AG 500 and Vydate.

Table 10.--Tests to control citrus mealybugs with selected chemicals evaluated on waxplant at 14-day postspray and on philodendron at 5-day postspray based on mean percent mortality

Treatment	Formulation	Rate of application		Mortality	
		Ml (g)/gal	Lb AI/100 gal	Waxplant	Philodendron
Diazinon AG 500-----	4.0 EC	4.73	0.50	16.3 cd	87.2 a
		2.37	.25	8.4 d	66.9 bc
Knox out----------	2.0 FM	9.46	.50	5.7 d	58.6 c
		4.73	.25	7.4 d	53.7 cd
Orthene----------	75 SP	3.03	.50	26.2 c	78.5 ab
		1.51	.25	12.6 cd	77.3 ab
Temik----------	10 G	---	1/5.00	2/20.4 cd	26.8 ef
		---	1/10.00	2/13.6 cd	39.8 de
Vydate----------	2.0 L	9.46	.50	95.6 a	91.9 a
		4.73	.50	79.8 b	84.5 ab
Untreated----------	---	---	---	4.9 d	17.8 f

1/ Applied as pounds of AI/acre.
2/ Count made at 30-day postspray.

Host: Coleus (Coleus blumei Benth. cv. Lord Falmouth) - Tested at Time of Transplanting With Systemic Granular Insecticides. Greenhouse pests have been inadvertently distributed when the coleus mother plant used for propagation cuttings was infested. Tests were made to determine whether infested rooted cuttings could be rendered pest free by incorporating a soil systemic granular insecticide at planting following initial rooting.

Coleus plants infested with citrus mealybugs were cut into 10-cm sections for rooting and placed in trays of vermiculite under intermittent mist. Well-rooted plants with mealybugs were transplanted in 10-cm-diameter standard plastic pots with potting soil. The systemic insecticides Temik, Dacamox, and Furadan, each 10 G formulations, were tested at 4.0, 2.0, and 1.0 pounds of active ingredient (AI) per acre, which are equivalent to 36.4, 18.2, and 9.10 mg of 10 G formulation per pot. Plants were potted on day 0 and insecticides were added to the top of the potting soil on day 1 with 200 ml of water added to each pot. They were watered lightly as needed to avoid splashing.

Plants were measured for height at the pot lip in centimeters on day 0. In table 8, test 4, plants were cut at the soil surface on day 29 and weighed in grams for biomass. Nymphs and adults were counted on day 29 on the top 8 to 12 leaves. In table 8, test 7, the trial time was extended to 60 days. Mealybugs were separated into young and older nymphs as well as adults, and the plant inflorescent spike was measured as a separate quantity from the plant.

Products showing activity against mealybugs at the time of transplanting: Temik, Dacamox, and Furadan.

Table 11.--Test to control citrus mealybugs on coleus at transplanting of rooted cuttings with selected chemicals evaluated at 0-, 16-, and 29-day posttreatments based on mean number of live insects and plant height and weight

Treatment and formulation	Rate of application[1]		Nymphs[2]	Adults[2]	Plant height on day--			Height differences on days--			Aerial weight
					0	16	19	0-16	16-29	0-29	
	Lb AI/ acre	Kg/ha			Cm	Cm	Cm	Cm	Cm	Cm	G
Temik 10 G-------	4.0	4.48	1.5 e	0.2 b	5.1 ab	10.1 a	23.6 ab	4.9 abc	13.4 bcd	18.4 cde	32.8 ab
	2.1	2.24	18.7 de	.3 b	4.3 abc	9.5 ab	23.4 ab	5.2 ab	13.8 cd	19.0 de	31.0 abc
	1.0	1.12	47.9 bcde	.4 b	4.1 abc	7.6 b	19.2 bc	3.4 bc	11.4 abc	14.9 abcd	24.7 cd
Dacamox 10 G-----	4.0	4.48	64.9 abcd	4.3 ab	5.5 a	10.3 a	19.9 bc	4.8 abc	9.5 a	14.3 abc	29.0 abcd
	2.0	2.24	75.2 abc	3.7 ab	4.8 abc	9.7 ab	20.3 bc	4.9 abc	10.5 ab	15.4 abcd	25.6 bcd
	1.0	1.12	89.3 ab	4.9 a	5.4 a	9.5 ab	19.2 bc	4.1 abc	9.7 a	13.8 ab	22.6 d
Furadan 10 G-----	4.0	4.48	48.9 bcde	5.3 a	4.8 abc	9.3 ab	20.7 abc	4.5 abc	11.3 abc	15.9 abcd	28.5 abcd
	2.0	2.24	36.1 cde	3.5 ab	3.5 c	9.3 ab	24.8 a	5.8 a	15.4 d	21.2 e	28.8 abcd
	1.0	1.12	26.8 cde	1.8 ab	3.7 bc	7.9 b	21.3 abc	4.2 abc	13.4 bcd	17.6 bcde	33.9 a
Untreated--------	---	---	106.6 a	2.4 ab	4.8 abc	7.9 b	17.3 c	3.1 c	9.3 a	12.5 a	23.3 d

1/ Surface area.
2/ 5 plants per treatment and 8-12 leaves per plant.

Table 12.--Test to control citrus mealybugs on coleus at transplanting of rooted cuttings with selected chemicals evaluated at 60-day posttreatment based on plant height and mean number of live insects

Treatment and formulation	Rate of application		Day 0		Plant height			Young nymphs	Older nymphs	Adults
			Plant height	Mealybugs	Rim to apical leaf node	Apical node to spike	Total plant height			
	Lb AI/acre	Kg/ha	Cm		Cm	Cm	Cm			
Temik 10 G------	4.0	4.48	12.2 bc	79.5 a	36.0 ab	26.0 a	62.8 a	1.8 c	0.4 e	0.2 d
	2.0	2.24	12.7 abc	68.0 a	38.1 a	22.4 ab	60.6 a	31.2 c	15.4 de	6.3 bcd
	1.0	1.12	11.9 c	65.1 a	35.8 ab	13.4 bc	49.3 b	49.0 c	30.1 cde	7.5 abcd
Dacamox 10 G----	4.0	4.48	12.3 bc	79.5 a	31.4 c	7.1 c	38.5 bc	242.9 a	116.6 a	13.6 ab
	2.0	2.24	13.0 abc	75.1 a	32.3 bc	7.4 c	39.7 bc	161.2 b	66.1 bc	10.7 abc
	1.0	1.12	13.9 a	80.5 a	33.8 bc	4.0 c	37.8 bc	167.6 b	21.3 de	15.2 a
Furadan 10 G----	4.0	1.12	13.0 abc	76.1 a	33.0 bc	3.6 c	36.6 bc	184.1 b	74.5 b	13.1 ab
	2.0	4.48	13.1 abc	68.3 a	35.9 ab	3.2 c	39.1 bc	160.0 b	86.5 ab	11.0 abc
	1.0	2.24	13.7 ab	78.2 a	35.7 ab	9.6 c	45.3 bc	172.0 b	48.0 bcd	4.4 cd
Untreated-------	---	---	12.7 abc	78.3 a	31.9 bc	3.5 c	35.4 c	189.1 b	64.9 bc	14.5 a

Green Peach Aphid (*Myzus persicae* (Sulzer))

Host: Chrysanthemum (*Chrysanthemum morifolium* Ramat. cv. Goldburst Mefo.). Chrysanthemum plants of medium height in 10.15-cm pots and heavily infested with green peach aphids were selected for the test. In early tests, the entire plant was carefully counted prior to treatment; this procedure was later discontinued. Similar entire plant counts were made for live aphids at selected days following treatment.

Five plants were sprayed per treatment unless otherwise indicated. Prespray counts per plant ranged from 300 to 700 before conversion to logarithms. The live green peach aphids on chrysanthemum were counted on the indicated day unless the count was converted to percent mortality.

Products effective against green peach aphids in one or more tests: Pirimor, Croneton, A-41286, Sumithion, Orthene, Curacron, Lannate, FMC 35001, Diazinon AG 500, M 9580, and Pramex + PBO.

Table 13*.--Test to evaluate selected chemicals against green peach aphids on chrysanthemum at 0- and 2-day postsprays based on mean number of live insects

Treatment	Formulation	Rate of application		Insects per plant at--		
				Prespray	0-day postspray	2-day postspray
		Ml (g)/ gal	Lb AI/ 100 gal			
Pirimor--------	50 WP	2.27	0.25	2.50 a	2.00 b	0.00 c
Croneton-------	4.0 EC	4.73	.50	2.51 a	1.90 b	.00 c
Water----------	---	---	---	2.50 a	2.46 a	2.43 b
Untreated------	---	---	---	2.51 a	2.61 a	2.61 a

Table 14*.--Tests to evaluate selected chemicals against green peach aphids on chrysanthemum at 0- and 1-day postsprays based on mean number of live insects

Treatment	Formulation	Rate of application		Insects per plant at--		
				Prespray	0-day postspray	1-day postspray
Test 1		Ml (g)/ gal	Lb AI/ 100 gal			
Pirimor--------	50 WP	2.27	0.25	2.70 a	2.06 b	0.09 c
Tween 20-------	NA	5.00	NA	2.70 a	2.62 a	2.39 b
Water----------	---	---	---	2.69 a	2.68 a	2.35 b
Untreated------	---	---	---	2.69 a	2.69 a	2.73 a
Test 2						
Pirimor[1/]------	50 WP	2.27	.25	2.78 a	2.18 b	.00 d
Croneton-------	4.0 EC	4.73	.50	2.79 a	(2/)	.00 d
Tween 20-------	NA	2.50	NA	2.79 a	2.76 a	2.45 c
Water----------	---	---	---	2.79 a	2.78 a	2.72 b
Untreated------	---	---	---	2.78 a	2.78 a	2.84 a
Test 3						
Croneton-------	4.0 EC	2.36	.25	2.74 a	2.69 a	2.70 a
A-41286--------	4.0 EC	3.80	.40	2.74 a	(2/)	.21 c
ABG-6070-------	2.0 EC	1.89	.10	2.75 a	2.54 a	2.01 b
Water----------	---	---	---	2.74 a	2.69 a	2.70 a

1/ 2.5 ml of Tween 20 added per gallon.
2/ Observation incomplete.

Table 15*.--Tests to evaluate selected chemicals against green peach aphids on chrysanthemum at 1- and 7-day postsprays based on mean number of live insects

Treatment	Formulation	Rate of application		Insects per plant at--		
				Prespray	1-day postspray	7-day postspray
		Ml (g)/ gal	Lb AI/ 100 gal			
Test 1						
A-41286--------	4.0 EC	3.80	0.40	2.86 a	1.99 b	1.92 b
ABG-6070-------	2.0 EC	1.89	.10	2.77 a	2.22 b	2.17 b
Untreated------	---	---	---	2.82 a	2.85 a	3.04 a
Test 2						
A-41286--------	4.0 EC	3.80	.40	2.86 a	1.10 c	1.25 c
ABG-6070-------	2.0 EC	1.89	.10	2.77 b	2.35 b	2.33 b
Untreated------	---	---	---	2.81 b	2.84 a	2.96 a
Test 3						
Malathion------	4.4 EC	15.00	1.74	2.77 a	2.09 c	1.94 c
Sumithion------	8.0 EC	7.10	1.50	2.78 a	1.98 c	1.73 c
Knox out-------	2.0 FM	30.00	1.60	2.78 a	2.36 b	2.45 b
Untreated------	---	---	---	2.78 a	2.79 a	2.84 a

Table 16.--Tests to evaluate selected chemicals against green peach aphids on chrysanthemum at 2-day postspray based on mean number of live insects

Treatment	Formulation	Rate of application		Insects per plant[1/]
		Ml (g)/ gal	Lb AI/ 100 gal	
Test 1				
Knox out	2.0 FM	26.11	1.38	190.0 b
		14.85	.79	127.1 b
Diazinon AG 500	4.0 EC	7.47	.79	5.3 a
	4.0 EC	3.68	.39	19.4 a
Orthene	75 SP	6.05	1.00	.0 a
Check, water	---	---	---	335.0 c
Test 2				
Curacron	6.0 E	6.31	1.00	.0 a
		3.15	.50	.0 a
Lannate	90 WP	2.52	.50	3.5 a
		2.52	.25	4.7 a
Orthene	75 SP	3.03	.50	.2 a
		1.51	.25	.3 a
Check, water	---	---	---	90.4 b
Test 3				
FMC 35001	4.0 EC	1.18	.125	3.0 a
		2.37	.25	.0 a
Malathion	4.4 EC[2/]	9.85	1.14	142.4 b
Diazinon AG 500	---	4.73	.5	14.4 a
Untreated	---	---	---	206.0 c

1/ 9 plants with 6 leaves per plant; whole numbers.
2/ 50 percent spray.

Table 17.--Tests to evaluate selected chemicals against green peach aphids on chrysanthemum at 2-day postspray based on mean percent mortality

Treatment	Formulation	Rate of application		Mortality
		Ml (g)/ gal	Lb AI/ 100 gal	
Test 1				
M 9580	2.0 EC	9.85	0.52	96.3 a
		16.53	.87	99.5 a
Diazinon AG 500	---	4.92	.52	85.3 a
Malathion	4.4 EC	9.84	.87	18.8 b
Untreated	---	---	---	4.8 c
Test 2				
Pramex	1.0 EC	5.0	.125	78.2 b
		10.00	.25	75.4 b
		20.00	.50	89.0 a
Untreated	---	---	---	1.4 c
Test 3				
Pramex + PBO	1.0-4.0 EC	2.5	.0625	77.2 b
		5.0	.125	99.2 a
		10.0	.25	95.4 a
Untreated	---	---	---	1.4 c
Test 4				
Pramex DX spray	---	15.0	NA	58.4 b
		30.0	NA	86.6 a
		60.0	NA	87.2 a
Untreated	---	---	---	1.4 c
Test 5				
Pydrin	2.0 EC	.06	1.25	80.6 c
		.12	2.4	89.6 b
Permethrin	2.0 EC	.06	1.2	87.4 bc
Pirimor	50 WP	.25	2.27	1/99.9 a
Untreated	---	---	---	1.0 d

1/ 4 aphids were alive out of 4,489.

Table 18.--Tests to evaluate selected chemicals against green peach aphids on chrysanthemum at 2-day postspray based on mean number of live and dead insects and mean percent mortality

Treatment	Formulation	Rate of application		Insects per plant	Mortality
		Ml (g)/ gal	Lb AI/ 100 gal		
Test 1					
Danitol----------	2.4 EC	0.79	0.05	445	26.42 d
		1.58	.10	502	37.93 c
		3.15	.20	543	75.30 b
Diazinon AG 500-----	---	4.73	.50	564	98.47 a
Pirimor----------	50 WP	2.27	.25	565	98.48 a
Water----------	---	---	---	669	1.71 e
Test 2					
SD 52618----------	85 WP	1.34	.25	239	98.95 a
		2.67	.50	389	99.62 a
		5.34	1.00	254	99.53 a
Diazinon AG 500-----	---	4.73	.50	345	98.00 a
Pirimor----------	50 WP	2.27	.25	389	99.53 a
Untreated----------	---	---	---	255	9.62 b

Greenhouse Whitefly (Trialeurodes vaporariorum (Westwood))

Host: Tomato (Lycospersicon esculentum Mill. cv. Manapal). Plants 60-80 cm tall in 15-cm pots were placed in a small greenhouse containing other tomato plants heavily infested with greenhouse whiteflies for a 24-hour period. The colony was several years old, and the plants and whiteflies were periodically sprayed with Sevin to restrict development of the introduced aphelinid parasite Encarsia formosa Gahan. After 24 hours, the plants were removed and placed in a separate greenhouse, where any remaining adults were killed by an overnight fumigation that had not been harmful to the eggs. The plants were monitored daily after 1 week for new crawlers. In early tests, treatments were made when the nymphs were 7 days old; later, applications were made at 3 and 10 days of age. One week after treatment, two leaflets were sampled from each plant. The first 50 nymphs per leaflet were examined for mortality.

Products effective against the greenhouse whitefly in one or more tests: Synthrin aqueous, Aqueous pyrenone garden spray, Sumithrin, Synthrin, Resmethrin, Pramex, Pramex + PBO, Pramex DX spray, Danitol, and SD 52618.

Table 19.--Tests to evaluate selected chemicals against greenhouse whitefly nymphs at 7 days of age on tomato at 3- and 7-day postsprays based on mean percent mortality

Treatment	Formulation	Rate of application		Mortality[1/]
		Ml (g)/ gal	Lb AI/ 100 gal	
Test 1*				
Permethrin	2.0 EC	2.30	0.125	64.0 a
Sumithion	8.0 EC	4.73	1.00	1.3 b
Dylox	4.0 LS	14.20	1.50	2.3 b
Metasystox R	2.0 SC	7.50	.40	3.6 b
Dylox	1.5 SC	28.40	1.125	.6 b
Metasystox R	.5 SC		.38	
Untreated	---	---	---	.3 b
Test 2[2/]				
Synthrin aqueous	.35%	NA	NA[3/]	97.3 a
Aqueous pyrenone garden spray	.02%	NA	NA	89.5 a
Pyrenone crop spray	6.0 %	NA	NA	59.8 b
Untreated	---	---	---	18.8 c
Test 3[4/]				
Sumithrin	2.0 EC	4.73	.250	100 a
		2.36	.125	99.9 a
Synthrin	2.0 EC	14.70	.780	100 a
		4.90	.260	100 a
Vydate	2.0 EC	9.46	.500	50.4 b
		4.73	.250	32.0 c
Check, water	---	---	---	.2 d

1/ Count made at 7-day postspray for tests 1 and 2 and at 3-day postspray for test 3.
2/ 20 plants per treatment with samples of 5 leaf disks 2.45 cm^2 per plant. Runoff coverage for 1st and 2d treatments and wet for 3d treatment.
3/ Aqueous preparation applied undiluted directly to plants.
4/ 5 leaf disks 2.45 cm^2 per plant.

Table 20.--Tests to evaluate selected chemicals against greenhouse whitefly nymphs at 3 and 10 days of age on tomato at 7-day postspray based on mean percent mortality

Treatment	Formulation	Rate of application		Mortality when-- 3 days old	Mortality when-- 10 days old
		Ml (g)/ gal	Lb AI/ 100 gal		
Test 1					
M 9580	2.0 EC	9.85	0.52	14.4 b	75.0 b
		4.92	.26	11.1 b	60.9 c
Diazinon AG 500	---	4.92	.52	95.9 a	61.2 c
Resmethrin	2.0 EC	4.92	.26	99.7 a	91.0 a
Untreated	---	---	---	2.2 c	10.1 d
Test 2					
Pramex	1.0 EC	5.0	.125	98.7 a	97.9 a
		10.0	.25	99.2 a	98.2 a
		20.0	.50	100.0 a	100.0 a
Untreated	---	---	---	8.4 b	21.9 b
Test 3					
Pramex + PBO	1.0-4.0 EC	2.5	.0625	93.0 b	75.9 b
		5.0	.125	92.3 b	91.3 a
		10.0	.25	99.8 a	98.2 a
Untreated	---	---	---	1.4 c	6.9 c
Test 4					
Pramex DX spray	---	15.0	---	93.2 a	91.4 b
		30.0	---	91.2 a	98.1 a
		60.0	---	95.6 a	100.0 a
Untreated	---	---	---	3.3 b	14.9 c
Test 5					
FMC 35001	4.0 EC	1.18	.125	24.0 c	57.0 b
		2.37	.25	83.9 b	51.0 b
Synthrin	2.0 EC	.26	4.92	96.0 a	98.5 a
Untreated	---	---	---	6.1 d	4.4 c
Test 6					
Pydrin	2.0 EC	1.2	.06	60.60 b	23.19 c
		2.4	.12	64.49 b	49.55 b
Permethrin	2.0 EC	1.2	.06	94.51 a	73.52 a
Synthrin	2.0 EC	4.9	.26	98.91 a	79.57 a
Untreated	---	---	---	.91 c	2.68 d

Table 21.--Tests to evaluate selected chemicals against greenhouse whitefly nymphs at 3 and 10 days of age on tomato at 7-day postspray based on mean number of live and dead insects and mean percent mortality

Treatment	Formulation	Rate of application		Nymphs per plant[1/]		Mortality when--	
				Day 3	Day 10	3 days old	10 days old
		Ml (g)/ gal	Lb AI/ 100 gal				
Test 1							
Danitol------	2.4 EC	0.79	0.05	168	---	98.43 a	58.60 b
		1.58	.10	170	---	100.00 a	75.90 b
		3.15	.20	153	---	100.00 a	88.20 a
Synthrin-----	2.0 EC	4.92	.26	190	---	88.09 b	64.45 b
Untreated----	---	---	---	164	---	2.92 c	3.39 c
Test 2							
SD 52618-----	85 WP	1.34	.25	92	160	96.71 a	28.37 b
		2.67	.50	215	136	98.00 a	30.33 b
		5.34	1.00	211	145	98.33 a	31.57 b
Synthrin-----	2.0 EC	4.92	.26	304	132	99.09 a	73.22 a
Untreated----	---	---	---	131	147	1.40 b	1.25 c

1/ 5 leaf disks 2.45 cm^2 per plant; not applicable for day 10-day postspray.

Table 22.--Test to evaluate selected chemicals against greenhouse whitefly nymphs at 10 days of age on tomato at 7-day postspray based on mean number of live and dead insects and mean percent mortality

Treatment	Formulation	Rate of application		Nymphs per plant[1/]	Mortality
		Ml (g)/ gal	Lb AI/ 100 gal		
SD 52618----------	85 WP	1.34	0.25	225	60.11 a
		2.67	.50	125	76.00 a
		5.34	1.00	244	85.40 a
Synthrin----------	2.0 EC	4.92	.26	167	80.59 a
Untreated---------	---	---	---	117	12.02 b

1/ 5 leaf disks 2.45 cm^2 per plant.

Euonymus Scale (Unaspis euonymi (Comstock))

Host: Euonymus (Euonymus japonica Thunb.). Well-branched euonymus shrubs averaging 60 cm in height with a natural infestation of euonymus scale were field dug from a nursery at Sowell, Md. They were potted in 3-gallon plastic containers and set in an open air coldframe for crawler emergence. Plants were examined and found to have a new infestation in early June. Sites of new infestations were marked with nursery tape on each plant. Plants were sprayed outdoors in groups of five per treatment to runoff with a pneumatic sprayer. Diazinon and Supracide were applied on June 14 and Dursban and Vydate 2 weeks later. One group of five infested plants remained unsprayed and served as a check. The spray date for both applications was sunny and cool, with an air temperature of 15.6°C. Plants were moved back to the coldframe. They were examined 3 weeks after the first application and 2 weeks after the second one to determine the percent mortality of female scales. New growth was examined with dissection microscopes to determine the number of living and dead females scales in the first 100 observed.

Host: Pachysandra (Pachysandra terminalis Sieb. & Zucc.). Pachysandra plants averaging 7.5 cm high and grown in 10.2-cm pots were infested in late May by overlaying cut stem and leaf sections from heavily infested euonymus. The euonymus sections were removed in mid-June, and euonymus scale crawlers were identified on individual plants. Plants were arranged in groups of 10 per treatment and sprayed to runoff outdoors with a pneumatic sprayer. One group of 10 infested plants remained unsprayed and served as a check. The spray date was sunny with an air temperature of 26.7°C. Treated plants were moved inside a shaded greenhouse. Infested stems and leaves were examined 2 weeks after treatment with a dissection microscope to determine the percent mortality of female scales. Plants were examined for the first 100 female scales, and because they were small, this number of scales was not found on all plants.

Products effective against the euonymus scale on euonymus or pachysandra: Dursban, Knox out, Supracide, and Vydate.

Table 23.--Tests to evaluate selected chemicals against euonymus scales on euonymus and pachysandra based on mean percent mortality

Treatment	Formulation	Rate of application		Mortality[1/]
		Ml (g)/ gal	Lb AI/ 100 gal	
		Euonymus		
Diazinon AG 500----	4.0 EC	4.73	0.50	61.0 c
		2.37	.25	68.8 bc
Dursban----------	2.0 EC	9.46	.50	86.6 a
		4.73	.25	79.2 ab
Supracide----------	2.0 E	9.46	.50	70.2 abc
		4.73	.25	61.4 c
Vydate----------	2.0 L	9.46	.50	86.6 a
		4.73	.25	84.6 a
Untreated----------	---	---	---	10.2 d
		Pachysandra		
Diazinon AG 500----	4.0 EC	4.73	.50	70.5 abcd
		2.37	.25	67.0 bcd
Dursban----------	2.0 EC	9.46	.50	82.2 ab
		4.73	.25	58.6 d
Knox out----------	2.0 FM	9.46	.50	82.3 ab
		4.73	.25	76.1 abc
Supracide----------	2.0 EC	9.46	.50	81.1 ab
		4.73	.25	84.0 a
Vydate----------	2.0 L	9.46	.50	63.0 cd
		4.73	.25	85.2 a
Untreated----------	---	---	---	32.9 e

1/ Count made at 14-day postspray except at 21-day postspray for euonymus when treated with Diazinon AG 500 and Supracide.

Vegetable Leafminer (Liriomyza sativae Blanchard)

Host: Lima bean (Phaseolus lunatus L. cv. Henderson). Paired lima bean plants 10 to 15 cm tall and greenhouse grown in 12.7-cm pots were exposed for 24 hours to a colony of vegetable leafminer adults. Test plants were removed to a separate greenhouse for 5 days to permit egg hatch and development to second-instar larvae. They were sprayed to runoff with a pneumatic sprayer and held for an indicated number of days. The leaves per treatment per test numbered 24, 32, or 40 depending on the availability of the host. The leaves were removed and examined under a dissection microscope. Mines were examined for the number of living and dead insects.

Products effective against the vegetable leafminer larvae in one or more tests: Dylox, Metasystox R, Dylox and Metasystox R, Sumithion, SD 43775, PP 557, M 9580, Diazinon AG 500, FMC 35001, Orthene, Pydrin, Permethrin, Danitol, and SD 52618.

Table 24*.--Tests to evaluate selected chemicals against vegetable leafminer larvae on lima bean at 4-day postspray based on mean number of larvae

Treatment	Formulation	Rate of application		Larvae per leaf	
				Live	Dead
Test 1		Ml (g)/ gal	Lb AI/ 100 gal		
Zoecon house plant spray	Spray	NA	NA	1.25 b	0.54 b
Plantabbs house plant insecticide	Aerosol	NA	NA	1.28 b	1.03 a
Ortho indoor plant insect spray	---do---	NA	NA	1.50 a	.35 c
Test 2					
Pirimor	50 WP	2.27	0.25	1.00 ab	.54 c
Imidan	1.0 EC	28.38	.75	1.06 a	.57 c
Dylox	4.0 LS	15.00	1.60	.00 c	1.18 a
Metasystox R	2.0 SC	7.50	.40	.88 b	.66 c
Dylox	1.5 LS	30.00	1.20	.00 c	.98 b
Metasystox R	.5 SC		.40		
Untreated	---	---	---	1.12 a	.02 d
Test 3					
PP 557	2.0 EC	2.30	.125	.12 b	1.23 a
SD 43775	2.4 EC	15.77	1.00	.08 b	1.32 a
Sumithion	8.0 EC	4.75	1.00	.10 b	.26 b
Untreated	---	---	---	1.50 a	.01 c
Test 4					
Malathion	4.4 EC	15.00	1.74	1.08 a	.67 a
Sumithion	8.0 EC	4.75	1.00	.34 a	.98 a
Test 5					
PP 557	2.0 EC	2.30	.125	.51 bc	1.09 a
Sumithion	8.0 EC	4.73	1.00	.43 cd	.37 c
Dylox	4.0 LS	14.20	1.50	.27 de	.19 cd
Metasystox R	2.0 SC	7.50	.40	.67 b	.59 b
Dylox	1.5 SC	28.40	1.125	.17 e	.11 d
Metasystox R	.5 SC		.38		
Untreated	---	---	---	1.34 a	.20 cd

Table 25.--Tests to evaluate selected chemicals against vegetable leafminer larvae on lima bean at 3- and 7-day postsprays based on mean percent mortality

Treatment	Formulation	Rate of application		Mortality at postspray day 1/-- 3	7
		Ml (g)/ gal	Lb AI/ 100 gal		
Test 1					
M 9580	2.0 EC	9.84	0.52	97.7 a	93.0 a
Diazinon AG 500	---	4.92	.52	99.5 a	90.9 a
Untreated	---	---	---	.8 b	.8 b
Test 2					
FMC 35001	4.0 EC	1.18	.125	81.4 a	77.4 b
		2.36	.25	100.0 a	83.3 ab
Orthene	75 SP	3.03	.50	100.0 a	83.6 ab
Diazinon AG 500	---	4.73	.50	100.0 a	87.2 a
Untreated	---	---	---	.2 b	.2 c

1/ 2 groups of plants infested at same time but treated at separate times.

Table 26.--Test to evaluate selected chemicals against vegetable leafminer larvae on lima bean at 3- and 7-day postsprays based on mean number of dead larvae and mean percent mortality

Treatment	Formulation	Rate of application		Larvae at postspray day-- 3	7	Mortality at postspray day-- 3	7
		Ml (g)/ gal	Lb AI/ 100 gal				
Pydrin	2.0 EC	1.2	0.06	328	532	100.00 a	98.04 a
		2.4	.12	317	624	100.00 a	100.00 a
Permethrin	2.0 EC	1.2	.06	535	447	98.19 a	100.00 a
Diazinon AG 500	---	4.73	.50	176	532	100.00 a	100.00 a
Untreated	---	---	---	38	28	8.17 b	5.63 b

Table 27.--Tests to evaluate selected chemicals against vegetable leafminer larvae on lima bean at 3- and 7-day postsprays based on mean number of live and dead larvae and mean percent mortality

Treatment	Formulation	Rate of application		Larvae per plant	Mortality at postspray day 1/ -- 3	7
		Ml (g)/ gal	Lb AI/ 100 gal			
Test 1						
Danitol----------	2.4 EC	0.79	0.05	113	99.91 a	93.42 b
		1.58	.10	108	100.00 a	89.58 b
		3.15	.20	111	100.00 a	95.07 a
Orthene----------	75 SP	3.03	.50	97	100.00 a	94.68 a
Diazinon AG 500---	---	4.73	.50	82	100.00 a	96.09 a
Untreated---------	---	---	---	124	7.76 b	10.32 c
Test 2						
SD 52618----------	85 WP	1.34	.25	124	100.00 a	99.72 a
		2.67	.50	113	100.00 a	99.38 a
		5.34	1.00	104	100.00 a	99.71 a
Orthene----------	75 SP	3.03	.50	133	99.40 a	96.94 b
Diazinon AG 500---	---	4.73	.50	90	100.00 a	100.00 a
Untreated---------	---	---	---	108	3.87 b	3.87 c

1/ 2 groups of plants infested at same time but treated at separate times.

Host: Lima bean (Phaseolus lunatus L. cv. Henderson) - Residual Effectiveness of Test Compounds Evaluated at 48-Hour Intervals. Paired lima bean plants averaging 20 cm tall and greenhouse grown in 10-cm pots were individually reduced by hand trimming to two leaves per plant. Pots were randomly divided into five groups of eight per treatment. Spray solutions were applied to runoff with a 1-gallon pneumatic sprayer. One group of eight plants remained untreated. Treated plants were placed in an insect-free greenhouse. A pair of pots from each treatment was placed in an individual fine-mesh Saran screen cage, 17.0 inches high by 14.0 inches wide by 21.0 inches long, on postspray days 0, 2, 4, and 6. Twenty unsexed vegetable leafminer adults collected from infested plants by aspiration were released into each cage to oviposit for 48 hours, after which the pots were removed. Four leaves from each pot were examined for the number of mines 5 days after removal from the cage. Observed leaves were individually held between folded paper towels for counting of puparia after larvae emergence. The complete test was replicated three times.

Product residually effective against vegetable leafminer larvae at 48-hour intervals: Knox out through day 4 at the high rate.

Table 28.--Test to evaluate selected chemicals against vegetable leafminer larvae on lima bean at 5-day postspray and 48-hour intervals based on mean number of mines and puparia and mean percent mortality

Treatment	Formulation	Rate of application		Day[1]	Mines per leaf[2]	Puparia per leaf[2]	Mortality[3]
		Ml (g)/ gal	Lb AI/ 100 gal				
Knox out----------	2.0 FM	7.5	0.40	0-2	3.4	4.8	0.0
				2-4	35.6	19.1	46.3
				4-6	33.7	13.8	59.0
				6-8	38.4	21.7	43.4
		15.0	.79	0-2	4.3	1.1	74.4
				2-4	10.3	4.7	54.3
				4-6	20.2	6.9	65.8
				6-8	17.0	7.4	56.4
Diazinon AG 500---	4.0 EC	3.75	.40	0-2	.4	1.3	.0
				2-4	17.7	6.8	61.5
				4-6	35.3	18.0	49.0
				6-8	32.2	15.9	50.6
		7.50	.79	0-2	.4	.8	.0
				2-4	20.5	10.7	47.8
				4-6	17.1	10.0	41.5
				6-8	23.1	16.2	29.8
Untreated---------	---	---	---	0-2	17.2	13.1	23.8
				2-4	57.9	31.8	45.0
				4-6	22.5	14.1	37.3
				6-8	25.8	16.3	36.8

1/ 48-hour period when bean leaves were exposed to leafminer adult postspray.
2/ Means for 3 separate tests.
3/ Difference between number of mines and puparia converted to percent mortality.

Host: Snapdragon (Antirrhinum majus L. cv. Potomac White). Newly infested snapdragon plants averaging 27 cm in height and greenhouse grown in 10-cm pots were selected from a bench of naturally infested plants for testing. They were arranged in groups of 10 per treatment and sprayed to runoff with a pneumatic sprayer. Plants were examined under a dissecting microscope to determine the number of live vegetable leafminers, including feeding larvae, and the number of exit holes as well as the number dead. These three observations were converted to percent mortality.

Products effective against vegetable leafminer larvae on snapdragons: None; some activity with Vydate.

Table 29.--Test to evaluate selected chemicals against vegetable leafminer larvae on snapdragon at 7-day postspray based on mean percent mortality

Treatment	Formulation	Rate of application		Mortality
		Ml (g)/ gal	Lb AI/ 100 gal	
Diazinon AG 500---------	4.0 EC	4.73	0.50	32.9 de
		2.73	.25	37.5 d
Knox out----------	2.0 FM	9.46	.50	43.9 cd
		4.73	.25	42.1 cd
Orthene----------	75 SP	3.03	.50	54.9 bc
		1.51	.25	64.8 ab
Vydate----------	2.0 L	9.46	.50	78.1 a
		4.73	.25	74.0 a
Untreated----------	---	---	---	19.1 e

Omnivorous Leafroller (*Platynota stultana* Walsingham)

Host: Chrysanthemum (*Chrysanthemum morifolium* Ramat. cv. Goldburst Mefo.). Chrysanthemum plants 38 to 53 cm tall were grown in 10-cm plastic pots. Each treatment consisted of five plants, each of which was infested by hand with five mid-instar larvae of the omnivorous leafroller. The insect colony was alternately maintained on lima bean (*Phaseolus lunatus* L. cv. Henderson) or a commercially prepared synthetic diet. At 48 hours following infestation with larvae, the plants were sprayed to a wet condition with test materials and two standards. Treated plants held in a greenhouse were placed in individual cakepans; Vaseline was applied to the edge to restrict larvae migration. Plants, soil, and pans were examined for larvae at 72-hour postspray.

Products effective against omnivorous leafminer larvae in one or more tests: Orthene, Pydrin, and UC 51762.

Table 30.--Tests to evaluate selected chemicals against omnivorous leafroller larvae on chrysanthemum at 2-day postspray based on mean percent mortality

Treatment	Formulation	Rate of application		Mortality
		Ml (g)/gal	Lb AI/100 gal	
Test 1				
FMC 35001----------	4.0 EC	1.18	0.125	12.0 bc
		2.37	.25	24.0 b
Orthene----------	75 SP	3.03	.5	100.0 a
Sevin----------	50 WP	9.00	1.0	88.0 a
Untreated----------	---	---	---	4.0 c
Test 2				
Pydrin----------	2.0 EC	1.2	.06	88.0 b
		2.4	.12	92.6 b
Permethrin---------	2.0 EC	1.2	.06	88.0 b
Orthene----------	75 SP	3.0	.50	100.0 a
Control (water)----	---	---	---	.0 c

Table 31.--Tests to evaluate selected chemicals against omnivorous leafroller larvae on chrysanthemum at 3-day postspray based on mean percent mortality

Treatment	Formulation	Rate of application		Mortality test-- 1	Mortality test-- 2
		Ml (g)/gal	Lb AI/100 gal		
UC 51762--------	4.0 EC	4.06	0.45	92.0 a	91.0 a
		6.78	.75	84.4 a	96.0 a
Sevin----------	50 WP	12.0	1.32	80.0 a	64.0 a
Orthene---------	75 SP	3.0	.50	95.0 a	100.0 a
Untreated-------	75 SP	---	---	12.0 b	.0 c

Twospotted Spider Mite (Tetranychus urticae Koch) and Carmine Spider Mite (T. cinnabarinus (Boisduval))

Host: Lima bean (Phaseolus lunatus L. cv. Henderson). Paired lima bean plants averaging 20 cm tall and greenhouse grown in 12.5-cm pots were individually reduced by hand trimming to two leaves per plant. Three cm of the apical leaf terminal as well as the paired posterior lobes were trimmed off with scissors to provide a semi-rectangular area to be counted. A small amount of lanolin was applied around each petiole to restrict twospotted and carmine spider mite migration. A section of an infested bean leaf from an established colony was placed on the upper surface of each test plant leaf. These sections were removed after 24 hours, and the mites on each leaf were counted prior to spray applications. Treatments were made to runoff with a pneumatic sprayer. Treated and untreated plants were examined at selected days following treatment for young mites. Analysis of variance on data was transformed to log (X+1) unless otherwise indicated. Means separation was by Duncan's test.

Products effective against the twospotted spider mite in one or more tests: Plictran, Chokem, Curacron, Vendex, M 9580, Pramex + PBO, and Danitol.

Products effective against the carmine spider mite: Pentac, Danitol, Plictran, Exhalt 800, Sumithion, SD 43775, Dylox, Metasystox R, Dylox and Metasystox R, Imidan, and Diazinon AG 500.

Table 32*.--Tests to evaluate selected chemicals against twospotted spider mites on lima bean at 1- and 7-day postsprays based on mean number of insects

Treatment	Formulation	Rate of application		Mites at prespray	1-day postspray		7-day postspray, live
		Ml (g)/ gal	Lb AI/ 100 gal		Live	Dead	
Test 1							
Diazinon AG 500----	4.0 EC	5.00	0.53	2.32 a	1.57 c	1.33 a	1.93 b
Knox out----------	2.0 FM	30.00	1.59	2.33 a	1.91 bc	1.24 ab	2.13 b
Plictran----------	50 WP	.75	.08	2.31 a	1.88 bc	1.23 ab	.63 c
Aqueous pyrenone garden spray------	---	15.00	---	2.32 a	2.07 ab	.85 b	2.22 b
Untreated---------	---	---	---	2.37 a	2.42 a	.18 c	2.65 a
Test 2							
Diazinon AG 500----	4.0 EC	5.00	.53	2.21 a	1.21 b	1.36 a	2.23 b
Knox out----------	2.0 FM	30.00	1.59	2.20 a	1.43 b	1.31 a	2.20 b
Plictran----------	50 WP	1.00	.10	2.18 a	.84 c	1.13 a	.13 c
Aqueous pyrenone garden spray------	---	15.00	---	2.23 a	2.06 a	1.17 a	2.53 a
Untreated---------	---	---	---	2.16 a	2.17 a	.68 b	2.53 a
Test 3							
Chokem------------	--- SC	105.00	NA	2.08 a	.63 c	1.50 a	1.48 b
Dursban-----------	4.0 EC	2.37	.25	2.13 a	1.32 b	1.29 a	2.41 a
Malathion---------	4.4 EC	15.00	1.74	2.11 a	1.36 b	1.50 a	2.43 a
Untreated---------	---	---	---	2.05 a	2.03 a	.86 b	2.44 a

Table 33.--Tests to evaluate selected chemicals against twospotted spider mites on lima bean at 5-day postspray based on mean percent mortality

Treatment	Formulation	Rate of application		Mortality test--1	Mortality test--2
		Ml (g)/gal	Lb AI/100 gal		
Knox out	2.0 FM	15.00	0.79	69.2 ab	59.8 a
		45.00	2.38	86.1 a	54.5 a
Diazinon AG 500	4.0 EC	4.73	.50	74.4 ab	56.7 a
Malathion	5.0 EC	5.0	.62	57.4 b	38.8 b
Untreated	---	---	---	12.7 c	21.6 c

Table 34.--Test to evaluate selected chemicals against twospotted mites on lima bean at 4-day postspray based on mean percent mortality

Treatment	Formulation	Rate of application		Mortality
		Ml (g)/gal	Lb AI/100 gal	
Synthrin aqueous	0.35%	NA	NA	58.8 a
Aqueous pyrenone garden spray	.02%	NA	NA	28.5 b
Pyrenone crop spray	6.0%	1/0.59	0.0078	8.6 c
Untreated	---	---	---	4.0 c

1/ 0.50 lb of AI/gallon.

Table 35.--Tests to evaluate selected chemicals against twospotted spider mites on lima bean at 4- to 8-day postsprays based on mean percent mortality

Treatment	Formulation	Rate of application		Mortality test--1	Mortality test--2	Mortality test--3
		Ml (g)/gal	Lb AI/100 gal			
Curacron	6.0 E	3.15	0.50	100.0 a	99.8 a	100.0 a
		1.58	.25	99.7 a	93.0 a	98.9 a
Vendex	50 WP	4.54	.50	93.2 a	85.4 a	93.5 b
Plictran	50 WP	2.27	.25	72.6 b	99.2 a	81.9 c
Check, water	---	---	---	2.1 c	1.8 b	4.2 d

Table 36.--Tests to evaluate selected chemicals against twospotted spider mites on lima bean at 4-day postspray based on mean percent mortality

Treatment	Formulation	Rate of application		Mortality
		Ml (g)/ gal	Lb AI/ 100 gal	
Test 1				
M 9580	2.0 EC	2.34	0.124	87.2 a
		2.54	.187	91.7 a
Plictran	50% WP	1.70	.187	93.9 a
Untreated	---	---	---	12.4 b
Test 2				
Pramex	1.0 EC	5.0	.125	16.7 b
		10.0	.25	79.7 a
		20.0	.50	81.6 a
Untreated	---	---	---	3.6 b
Test 3				
Pramex + PBO	1.0-4.0 EC	2.5	.0625	61.0 b
		5.0	.125	41.3 c
		10.0	.25	94.7 a
Untreated	---	---	---	1.2 d
Test 4				
Pramex DX spray	---	15.0	NA	75.5 b
		30.00	NA	89.4 a
		60.0	NA	91.7 a
Untreated	---	---	---	1.0 c
Test 5				
M 9580	2.0 EC	2.34	.124	87.2 a
		2.54	.187	91.7 a
Plictran	50% WP	1.70	.187	93.9 a
Untreated	---	---	---	12.4 b

Table 37.--Tests to evaluate selected chemicals against twospotted spider mites and carmine spider mites on lima bean at 4-day postspray based on mean number of live and dead insects and mean percent mortality

Treatment	Formulation	Rate of application		Adult females		Adult males and nymphs	
				Per plant	Mortality	Per plant	Mortality
		Ml (g)/ gal	Lb AI/ 100 gal				
			Twospotted spider mite				
Danitol----------	2.4 EC	0.79	0.050	40	85.96 c	93	91.88 b
		1.58	.100	36	96.52 b	60	98.64 a
		3.15	.200	43	97.00 b	90	94.54 b
Pentac----------	50 WP	2.27	.250	34	87.55 c	61	87.46 b
Plictran----------	50 WP	1.70	.187	40	99.59 a	65	99.34 a
Distilled water----	---	---	---	93	3.72 d	47	4.23 c
			Carmine spider mite				
Danitol----------	2.4 EC	.79	.050	34	98.40 a	18	96.36 a
		1.58	.100	39	97.50 a	46	95.67 a
		3.15	.200	35	95.27 a	37	99.09 a
Pentac----------	50 WP	2.27	.250	28	91.87 a	42	94.23 a
Plictran----------	50 WP	1.70	.187	27	100.00 a	55	97.66 a
Distilled water----	---	---	---	34	18.48 b	21	32.44 b

Table 38*.--Test to evaluate selected chemicals against carmine spider mites on lima bean at 1-hour, 3-day, and 7-day postsprays based on mean number of live insects

Treatment	Formulation	Rate of application		Mites at prespray	Mites at postspray--		
					1 hour	3 days	7 days
		Ml (g)/ gal	Lb AI/ 100 gal				
Exhalt 800------	---	5.00	NA	1.91 a	1.51 a	1.66 a	1.75 b
Water----------	---	---	---	1.84 a	1.43 a	1.75 a	2.03 a

Table 39*.--Test to evaluate selected chemicals against carmine spider mites on lima bean at 0.5-hour, 3-day, and 7-day postsprays based on mean number of live insects

Treatment	Formulation	Rate of application		Mites at prespray	Mites at postspray--		
					0.5 hour	3 days	7 days
		Ml (g)/ gal	Lb AI/ 100 gal				
Exhalt 800------	---	15.00	NA	1.82	1.19 a	1.14 b	0.98 b
Water----------	---	---	---	1.83	1.23 a	1.74 a	1.92 a

Table 40*.--Tests to evaluate selected chemicals against carmine spider mites on lima bean at 1- and 7-day postsprays based on mean number of live insects

Treatment	Formulation	Rate of application		Mites at prespray	Mites at postspray day-- 1	7
		Ml (g)/ gal	Lb AI/ 100 gal			
Test 1						
Malathion	4.4 EC	15.00	1.74	1.50 a	0.10 c	1.15 b
Sumithion	8.0 EC	7.10	1.50	1.50 a	.84 b	1.73 ab
Water	---	---	---	1.42 a	1.24 a	2.20 a
Test 2						
Pirimor[1/]	50 WP	2.27	.25	2.01 a	1.37 b	1.05 b
Imidan	1.0 EC	28.40	.75	2.06 a	1.18 b	.19 cd
Dylox	4.0 LS	15.00	1.60	1.95 a	.33 c	.46 c
Metasystox R	2.0 SC	7.50	.40	1.94 a	.42 c	.00 d
Dylox	1.5 SC	30.00	1.20	2.01 a	.31 c	.09 cd
Metasystox R	.5 SC		.40			
Untreated	---	---	---	1.82 a	1.82 a	1.93 a
Test 3						
A-47171	2.0 EC	37.80	2.00	1.32 a	.75 bc	1.00 cd
ABG-6070	4.0 EC	1.89	.20	1.48 a	.95 b	1.65 b
Diazinon AG 500	4.0 EC	5.00	.53	1.50 a	.76 bc	.69 d
Ficam W	76 WP	22.72	3.80	1.52 a	.90 b	1.17 c
Imidan	1.0 EC	28.40	.75	1.51 a	.62 c	.05 e
Untreated	---	---	---	1.49 a	1.46 a	2.00 a

1/ 0.5 tsp of Tween 20 added per gallon.

Table 41*.--Test to evaluate selected chemicals against carmine spider mites on lima bean at 1- and 4-day postsprays based on mean number of live insects

Treatment	Formulation	Rate of application		Mites at postspray day-- 1	4
		Ml (g)/ gal	Lb AI/ 100 gal		
Malathion	4.4 EC	15.00	1.74	1.53 a	1.45 b
Sumithion	8.0 EC	4.75	1.00	1.66 a	1.46 b
Untreated	---	---	---	1.92 a	2.21 a

Table 42*.--Test to evaluate selected chemicals against carmine spider mites on lima bean at 1-, 4-, and 14-day postsprays based on mean number of live insects

Treatment	Formulation	Rate of application		Mites at prespray	Mites at postspray day--		
		Ml (g)/ gal	Lb AI/ 100 gal		1	4	14
PP 557----------	2.0 EC	2.30	0.125	1.66 b	0.69 b	0.91 c	0.61 c
SD 43775--------	2.4 EC	15.70	1.00	1.80 b	.39 b	.82 c	.45 c
Sumithion-------	8.0 EC	4.75	1.00	1.65 b	.46 b	1.31 b	1.06 b
Untreated-------	---	---	---	2.20 a	1.92 a	2.14 a	2.30 a

Table 43*.--Test to evaluate selected chemicals against carmine spider mites on lima bean at 1-, 4-, and 7-day postsprays based on mean number of live insects

Treatment	Formulation	Rate of application		Mites at prespray	Mites at postspray day--		
		Ml (g)/ gal	Lb AI/ 100 gal		1	4	7
ABG-6070---------	4.0 EC	1.89	0.20	1.50 a	1.01 b	1.29 b	1.42 b
Ficam W----------	76 WP	22.70	3.80	1.67 a	.95 b	.77 c	.73 c
FMC 33297--------	3.2 EC	2.36	.20	1.70 a	.61 c	.56 cd	.35 d
Imidan-----------	1.0 EC	28.40	.75	1.60 a	.51 c	.45 d	.26 d
SD 43775---------	2.4 EC	3.15	.20	1.69 a	.74 bc	.69 cd	.30 d
Untreated--------	---	---	---	1.68 a	1.78 a	1.98 a	2.01.a

APPENDIX I.--COOPERATORS AND TRADE, COMMON, AND CHEMICAL NAMES OR COMPOSITION OF TABULAR MATERIALS

	Chemical name[1/] or composition
Abbott Laboratories - Agricultural and Veterinary Products Division	
A-41286	7-(5-chloro-2-thienyl)-4-ethoxy-3,5-dioxa-6-aza-4-phosphaoct-6-ene-8-nitrile 4-sulfide
A-47171	1,1-(2-methylpropylidene)bis[4-ethoxybenzene]
ABG-6070	(Z)-3-chloro-4-phenyl-2-butenyl cis,trans-(+)-2,2-dimethyl-3-(2-methyl-1-propenyl)cyclopropanecarboxylate
Atlantic & Pacific Research, Inc.	
Chokem	(2-methylpropene)-butene copolymers
Chevron Chemical Company - Ortho Division	
Malathion	diethyl [(dimethoxyphosphinothioyl)thio]=butanedioate
Orthene (acephate)	O,S-dimethyl acetylphosphoramidothioate
Ortho indoor plant insect spray	pyrethrins and rotenone: 1,2,12,12a-tetrahydro-8,9-dimethoxy-2-(1-methylethenyl)=[1]benzopyrano[3,4-b]furo[2,3-h][1]benzopyran-6(6aH)-one and piperonyl butoxide: 5-[[2-(2-butoxyethoxy)ethoxy]methyl]-6-propyl-1,3-benzodioxole
CIBA-GEIGY Corporation - Agricultural Division	
Curacron (profenofos)	O-(4-bromo-2-chlorophenyl) O-ethyl S-propyl phosphorothioate
Diazinon AG 500	O,O-diethyl O-[6-methyl-2-(1-methylethyl)-4-pyrimidinyl] phosphorothioate
Supracide (methidathion)	S-[(5-methoxy-2-oxo-1,3,4-thiadiazol-3(2H)-yl)=methyl] O,O-dimethyl phosphorodithioate
Diamond Shamrock Corporation	
Dacamox (thiofanox)	3,3-dimethyl-1-(methylthio)-2-butanone O-[(methylamino)carbonyl]oxime

1/ A chemical occupying two lines separated by an equal (=) sign is joined together without any separation if written in one line.

	Chemical name or composition
Dow Chemical, U.S.A.	
Dursban (chloropyrifos)----	O,O-diethyl O-(3,5,6-trichloro-2-pyridinyl) phosphorothioate
Plictran (cyhexatin)-------	tricyclohexylhydroxystannane
E. I. du Pont de Nemours & Company, Inc. - Biochemicals Department	
Lannate (methomyl)---------	methyl N-[[(methylamino)carbonyl]oxy]= ethanimidothioate
Vydate (oxamyl)------------	methyl 2-(dimethylamino)-N-[[methylamino)= carbonyl]oxy]-2-oxoethanimidothioate
Fairfield American	
Aqueous pyrenone garden spray---------------------	pyrethrins 0.02%; 5-[[2-(2-butoxyethoxy)ethoxy]= methyl]-6-propyl-1,3-benzodioxole, technical 0.20% [equivalent to 0.16% of the benzodioxole and 0.04% related compounds]; petroleum distillate
Pyrenone crop spray--------	pyrethrins 6.00%; 5-[[2-(2-butoxyethoxy)ethoxy]= methyl]-6-propyl-1,3-benzodioxole technical 60.00% [equivalent to 48.00% of the benzodioxole and to 12% related compounds]; petroleum distillate 24.00%
Synthrin aqueous 0.35%-----	resmethrin [cis/trans isomer ratio: max 30% cis and min. 70% trans]
Tween 20 (polysorbate 20)----------	polyoxyethylene 20 sorbitan monolaurate
Fisons Corporation - Agricultural Chemicals Division	
Ficam W (bendiocarb)-------	2,2-dimethyl-1,3-benzodioxol-4-yl- methylcarbamate
FMC Corporation - Agricultural Chemicals Division	
Aqueous pyrenone garden spray---------------------	5-[[2-(2-butoxyethoxy)ethoxy]methyl]-6- propyl-1,3-benzodioxole and pyrethrins
FMC 33297 (permethrin)-----	(3-phenoxyphenyl)methyl cis,trans-(±)-3- (2,2-dichloroethenyl)-2,2- dimethylcyclopropanecarboxylate
FMC 35001 (carbosulfan) (Advantage)---------------	2,3-dihydro-2,2-dimethyl-7-benzofuranyl [(dibutylamino)thio]methylcarbamate
Furadan (carbofuran)-------	2,3-dihydro-2,2-dimethyl-7-benzofuranyl methylcarbamate

	Chemical name or composition
ICI Americas Inc. - Agricultural Chemicals Division	
Pirimor (pirimicarb)	2-(dimethylamino)-5,6-dimethyl-4-pyrimidinyl dimethylcarbamate
PP 557 (permethrin) (Ambush)	(3-phenoxyphenyl)methyl cis,trans-(±)-3-(2,2-dichloroethenyl)-2,2-dimethylcyclopropanecarboxylate
Kay Fries, Inc. - Crop Production Division	
Exhalt 800	polymerized pinene, saturated naphthenes, and paraffins (98.5%)
Mobay Chemical Corporation - Agricultural Chemicals Division	
Croneton (ethiofencarb)	2-[(ethylthio)methyl]phenyl methylcarbamate
Dylox and Metasystox R	dimethyl (2,2,2-trichloro-1-hydroxyethyl)-phosphonate and S-[2-(ethylsulfinyl)ethyl] O,O-dimethyl phosphorothioate
Dylox (trichlorfon)	dimethyl (2,2,2-trichloro-1-hydroxyethyl)-phosphonate
Metasystox R (oxydemeton-methyl)	S-[2-(ethylsulfinyl)ethyl] O,O-dimethyl phosphorothioate
Montedison	
M 9580	O-(3-chloro-1-methyl-1H-pyrazol-5-yl) O-ethyl O-methyl phosphorothioate
Penick Corporation	
Permethrin	(3-phenoxyphenyl)methyl cis,trans-(±)-3-(2,2-dichloroethenyl)-2,2-dimethylcycopropanecarboxylate
Pramex (permethrin)	(3-phenoxyphenyl)methyl cis,trans-(±)-3-(2,2-dichloroethenyl)-2,2-dimethylcyclopropanecarboxylate
Pramex + PBO (permethrin + piperonyl butoxide)	(3-phenoxyphenyl)methyl cis,trans-(±)-3-(2,2-dichloroethenyl)-2,2-dimethylcyclopropanecarboxylate + 5-[[2-(2-butoxyethoxy)ethoxy]methyl]-6-propyl-1,3-benzodioxole
Pramex DX spray	permethrin, rotenone, other cubé resins, piperonyl butoxide, pine oil, soya bean oil, aromatic petroleum distillates, inert ingredients

	Chemical name or composition
Synthrin (resmethrin)------	[5-(phenylmethyl)-3-furanyl]methyl 2,2-dimethyl-3-(2-methyl-1-propenyl)=cyclopropanecarboxylate
Penwalt Corporation - Agchem Division	
Knox out (diazinon)--------	O,O-diethyl O-[6-methyl-2-(1-methylethyl)-4-pyrimidinyl] phosphorothioate
Plantabbs Corporation	
House plant insecticide----	pyrethrins and 2-(2-ethylhexyl)-3a,4,7,7a-tetrahydro-4,7-methano-1H-isoindole-1,3(2H)-dione and diethyl [(dimethoxyphosphinothioyl)=thio]butanedioate and rotenone: 1,2,12,12a-tetrahydro-8-9-dimethoxy-2-(1-methylethenyl)=[1]benzopyrano[3,4-b]furo[2,3-h][1]=benzopyran-6(6aH)-one
Shell Oil Company - Shell Development Company	
Pydrin (fenvalerate)-------	cyano(3-phenoxyphenyl)methyl 4-chloro-alpha-(1-methylethyl)benzeneacetate
SD 43775 (fenvalerate)-----	cyano(3-phenoxyphenyl)methyl 4-chloro-alpha-(1-methylethyl)benzeneacetate
SD 52618-------------------	5,6-dihydro-2-(aci-nitromethyl)-4H-1,3-thiazine, calcium salt (2:1)
Vendex (fenbutation oxide)-------	hexakis(2-methyl-2-phenylpropyl)distannoxane
Stauffer Chemical Company	
Imidan (phosmet)-----------	S-[(1,3-dihydro-1,3-dioxo-2H-isoindol-2-yl)=methyl] O,O-dimethyl phosphorodithioate
Sumithion (fenitrothion)---	O,O-dimethyl O-(3-methyl-4-nitrophenyl) phosphorothioate
Sumitomo Chemical Company, Ltd.	
Danitol (fenpropathrin)----	cyano(3-phenoxyphenyl)methyl 2,2,3,3-tetramethylcyclopropanecarboxylate
Sumithrin-----------------	(3-phenoxyphenyl)methyl 2,2-dimethyl-3-(2-methyl-1-propenyl)cyclopropanecarboxylate
Union Carbide Corporation	
Sevin (carbaryl)-----------	1-naphthalenyl methylcarbamate
Temik (aldicarb)-----------	2-methyl-2-(methylthio)propanal O-[(methylamino)carbonyl]oxime

	Chemical name or composition
UC 51762 (thiodicarb) (Larvin)	dimethyl N,N-[thiobis[(methylimino)=carbonyloxy]]bis[ethanimidothioate]

Zoecon Corporation

House plant spray	methoprene: 1-methylethyl (E,E)-11-methoxy-3,7,11-trimethyl-2,4-dodecadienoate and hexadecyl cyclopropanecarboxylate and resmethrin: [5-(phenylmethyl)-3-furanyl]methyl 2,2-dimethyl-3-(2-methyl-1-propenyl)=cyclopropanecarboxylate
Pentac	1,1',2,2',3,3',4,4',5,5'-decachlorobi-2,4-cyclo=pentadien-1-yl

APPENDIX II.--ORIGINAL UNTRANSFORMED TABULAR DATA

Table 1.--Citrus mealybugs on coleus

Treatment	Prespray			4-day postspray			7-day postspray		
	Small nymphs	Large nymphs	Adults	Small nymphs	Large nymphs	Adults	Small nymphs	Large nymphs	Adults
Test 1									
SD 43775-------	254.67 ab	20.33 ab	9.67 a	63.00 b	19.33 bc	16.67 ab	63.67 b	35.00 ab	33.33 b
ABG-6070-------	309.00 ab	14.67 b	7.33 a	157.33 ab	37.00 b	19.00 ab	129.67 b	109.33 a	30.33 b
FMC 33297------	484.67 a	8.00 b	9.33 a	16.00 b	15.33 bc	6.00 b	11.33 b	28.33 ab	11.33 b
Ficam W--------	208.33 b	30.00 ab	17.67 a	8.00 b	5.00 c	4.00 b	.33 b	2.67 b	8.33 b
Imidan---------	252.33 ab	26.00 ab	7.33 a	40.00 b	13.67 bc	9.67 ab	21.00 b	19.00 ab	15.33 b
Untreated------	231.33 b	62.67 a	15.33 a	357.67 a	94.33 a	47.67 a	385.67 a	111.33 a	88.33 a
Test 2									
PP 557---------	310.33 ab	32.00 a	8.33 a	27.33 b	29.00 b	16.33 ab	65.67 b	9.67 b	17.33 b
Sumithion------	260.33 b	33.00 a	13.33 a	1.67 b	.67 c	4.67 b	9.00 b	.00 b	1.67 b
Dylox----------	233.00 b	23.00 a	6.00 a	91.00 ab	21.67 bc	8.67 b	72.33 b	17.33 b	8.00 b
Metasystox R---	547.33 a	47.67 a	6.00 a	17.33 b	1.33 c	3.67 b	17.67 b	.67 b	3.33 b
Dylox and Metasystox R--	318.67 ab	46.00 a	8.66 a	4.33 b	3.67 c	2.00 b	21.00 b	3.00 b	2.00 b
Untreated------	272.00 b	52.67 a	9.67 a	171.33 a	100.67 a	26.00 a	258.00 a	65.33 a	49.33 a

Table 2.--Citrus mealybugs on coleus

Treatment	Prespray			5-day postspray			9-day postspray		
	Small nymphs	Large nymphs	Adults	Small nymphs	Large nymphs	Adults	Small nymphs	Large nymphs	Adults
Diazinon AG 500-	259.33 a	38.67 a	33.67 a	32.33 bc	6.67 c	11.33 b	199.33 a	7.67 b	5.00 b
ABG-6070--------	263.33 a	59.33 a	32.67 a	198.00 ab	74.67 b	26.33 b	355.33 a	45.67 ab	41.33 b
A-47171---------	216.00 a	39.00 a	43.00 a	172.33 abc	35.67 bc	38.67 ab	310.67 a	9.67 b	34.67 b
Ficam W---------	196.33 a	45.67 a	44.33 a	1.00 c	2.33 c	1.33 b	.00 a	.33 b	.33 b
Imidan----------	350.67 a	65.33 a	48.33 a	6.33 c	7.33 c	26.33 b	3.67 a	2.00 b	8.67 b
Untreated-------	387.33 a	92.33 a	49.33 a	266.67 a	133.67 a	94.33 a	204.67 a	109.33 a	175.33 a

Table 3.--Citrus mealybugs on coleus

Treatment	Prespray			6-day postspray		
	Small nymphs	Large nymphs	Adults	Small nymphs	Large nymphs	Adults
Test 1						
Diazinon AG 500---	209.33 cd	69.67 a	34.67 a	39.67 b	10.33 b	4.67 b
Knox out----------	165.00 d	80.33 a	27.00 a	147.00 ab	52.67 ab	42.33 ab
Plictran----------	308.00 ab	63.33 a	57.67 a	294.00 ab	59.33 b	52.33 ab
Aqueous pyrenone garden spray-----	245.33 bc	68.67 a	36.33 a	98.00 ab	57.67 b	43.00 ab
Untreated---------	340.33 a	72.33 a	56.67 a	319.00 a	65.00 a	62.33 a
Test 2						
Chokem------------	393.67 a	50.00 a	32.00 a	212.67 b	64.67 a	48.33 ab
Dursban-----------	701.00 a	34.33 a	37.33 a	10.33 b	.00 b	4.67 c
Malathion---------	470.33 a	34.33 a	31.00 a	54.67 b	5.67 b	16.33 bc
Untreated---------	564.67 a	47.00 a	43.67 a	1,592.33 a	92.67 a	63.67 a

Table 4.--Citrus mealybugs on coleus

Treatment	Prespray			3-day postspray		
	Small nymphs	Large nymphs	Adults	Small nymphs	Large nymphs	Adults
Diazinon AG 500---	273.50 a	131.50 a	57.50 a	60.50 a	50.50 a	55.50 b
Knox out----------	239.00 a	194.50 a	50.00 ab	22.50 a	44.50 a	41.50 b
Plictran----------	181.00 a	99.00 a	21.00 b	81.50 a	118.00 a	29.50 b
Aqueous pyrenone garden spray-----	407.50 a	89.00 a	19.50 b	235.00 a	92.00 a	32.50 b
Untreated---------	289.00 a	166.50 a	71.50 a	405.50 a	167.00 a	146.00 a

Table 5.--Citrus mealybugs on coleus

Treatment	Prespray			4-day postspray		
	Small nymphs	Large nymphs	Adults	Small nymphs	Large nymphs	Adults
SD 43775----------	425.33 a	32.67 a	1.67 a	107.00 a	21.67 ab	8.33 a
PP 557------------	466.67 a	28.67 a	2.00 a	66.67 a	25.33 a	4.67 a
Sumithion---------	653.00 a	20.67 a	2.33 a	1.00 a	.33 b	2.00 a

Table 6.--Citrus mealybugs on coleus

Treatment	Prespray			7-day postspray		
	Small nymphs	Large nymphs	Adults	Small nymphs	Large nymphs	Adults
Pirimor-----------	337.33 a	25.67 a	8.33 a	103.33 b	67.00 a	25.67 a
Imidan------------	337.33 a	25.67 a	8.33 a	202.67 ab	47.33 ab	14.33 ab
Dylox-------------	372.33 a	7.00 a	1.33 b	111.00 b	17.67 bc	5.33 b
Metasystox R------	533.67 a	22.33 a	4.33 ab	42.33 b	7.67 c	2.00 b
Dylox and Metasystox R-----	391.33 a	28.67 a	5.00 ab	54.33 b	4.67 c	3.00 b
Untreated---------	401.00 a	5.33 a	.67 b	339.33 a	25.33 bc	4.00 b

Table 13.--Green peach aphids on chrysanthemum

Treatment	Insects per plant at-- Prespray	0-day postspray	2-day postspray
Pirimor	346.10 a	110.10 b	0.00 c
Croneton	346.00 a	83.60 b	.00 c
Water	346.40 a	315.30 b	313.60 b
Untreated	345.90 a	345.90 a	440.20 a

Table 14.--Green peach aphids on chrysanthemum

Treatment	Insects per plant at-- Prespray	0-day postspray	1-day postspray
Test 1			
Pirimor	509.00 a	128.40 b	0.30 c
Tween 20	508.90 a	430.10 a	226.10 b
Water	509.10 a	487.90 a	296.60 b
Untreated	508.90 a	508.90 a	557.70 a
Test 2			
Pirimor[1/]	633.20 a	159.00 b	0.00 d
Croneton	633.30 a	([2/])	.00 d
Tween 20	633.20 a	599.40 a	310.80 c
Water	633.40 a	626.30 a	563.70 b
Untreated	633.30 a	633.30 a	725.70 a
Test 3			
Croneton	573.00 a	520.40 a	540.00 a
A-41286	575.00 a	([2/])	.80 b
ABG-6070	574.00 a	362.40 a	112.60 b
Water	573.00 a	520.40 a	540.00 a

1/ 2.5 ml of Tween 20 added per gallon.
2/ Observation incomplete.

Table 15.--Green peach aphids on chrysanthemum

Treatment	Insects per plant at-- Prespray	1-day postspray	7-day postspray
Test 1			
A-41286	731.80 a	149.00 a	215.60 b
ABG-6070	601.80 b	197.40 b	212.40 b
Untreated	674.20 ab	724.40 a	1,134.20 a
Test 2			
A-41286	732.40 a	19.40 c	28.60 c
ABG-6070	600.60 b	236.80 b	241.60 b
Untreated	658.60 b	706.40 a	956.60 a
Test 3			
Malathion	619.80 a	127.00 c	107.80 c
Sumithion	617.00 a	99.20 c	65.80 c
Knox out	620.80 a	240.60 b	289.00 b
Untreated	626.40 a	634.00 a	772.60 a

Table 19.--Greenhouse whiteflies on tomato

Treatment	Postspray Live	Dead
Test 1		
Permethrin	108 b	192 a
Sumithion	296 a	4 b
Dylox	293 a	7 b
Metasystox R	289 a	11 b
Dylox and Metasystox R	289 a	12 b
Untreated	299 a	1 b

Table 24.--Vegetable leafminers on lima bean

Treatment	Larvae per leaf	
	Live	Dead
Test 1		
Zoecon house plant spray	17.78 b	3.08 b
Plantabbs house plant insecticide	20.40 b	11.73 a
Ortho indoor plant insect spray	31.88 b	1.60 b
Test 2		
Pirimor	10.53 b	3.22 c
Imidan	11.78 ab	3.28 c
Dylox	.00 c	16.50 a
Metasystox R	8.13 b	4.22 c
Dylox and Metasystox R	.00 c	9.94 b
Untreated	14.94 a	.09 c
Test 3		
PP 557	.63 b	18.83 a
SD 43775	.58 b	21.42 a
Sumithion	.38 b	1.13 b
Untreated	33.88 a	.04 b
Test 4		
Malathion	21.00 a	6.33 a
Sumithion	3.75 a	13.88 a
Test 5		
PP 557	3.73 b	14.78 a
Sumithion	2.45 b	1.88 b
Dylox	1.50 b	.83 b
Metasystox R	4.93 b	3.78 b
Dylox and Metasystox R	.80 b	.43 b
Untreated	24.20 a	1.00 b

Table 32.--Twospotted spider mites on lima bean

Treatment	Mites at prespray	1-day postspray		7-day post-spray, live
		Live	Dead	
Test 1				
Diazinon AG 500	271.95 a	65.75 b	27.05 a	147.85 b
Knox out	267.90 a	91.05 b	21.25 a	160.30 b
Plictran	273.40 a	112.60 b	24.90 a	8.05 c
Aqueous pyrenone garden spray	272.25 a	143.25 b	7.85 ab	195.10 b
Untreated	277.25 a	298.35 a	.85 b	471.25 a
Test 2				
Diazinon AG 500	189.45 a	21.70 b	25.00 a	187.75 b
Knox out	188.80 a	33.05 b	26.55 a	182.05 b
Plictran	186.60 a	7.30 b	16.00 ab	1.90 c
Aqueous pyrenone garden spray	196.00 a	126.75 a	16.35 ab	358.55 a
Untreated	185.85 a	183.30 a	6.15 b	385.95 a
Test 3				
Chokem	142.85 a	4.80 b	38.15 a	42.90 b
Dursban	144.10 a	23.85 b	19.75 b	270.50 a
Malathion	143.75 a	27.55 b	35.30 a	290.60 a
Untreated	143.40 a	137.90 a	7.90 b	316.95 a

Table 38.--Carmine spider mites on lima bean

Treatment	Mites at prespray	Mites at postspray-- 1 hour	3 days	7 days
Exhalt 800	87.65 a	43.65 a	52.70 a	63.00 b
Water	86.55 a	31.70 a	65.10 a	121.45 a

Table 39.--Carmine spider mites on lima bean

Treatment	Mites at prespray	Mites at postspray-- 0.5 hour	3 days	7 days
Exhalt 800	104.85 a	25.75 a	19.15 b	12.10 b
Water	101.60 a	29.20 a	70.60 a	101.10 a

Table 40.--Carmine spider mites on lima bean

Treatment	Mites at prespray	Mites at postspray day-- 1	7
Test 1			
Malathion	36.20 a	0.45 b	46.35 b
Sumithion	36.35 a	9.45 b	69.70 b
Water	35.90 a	24.00 a	264.35 a
Test 2			
Pirimor[1/]	136.80 a	32.60 b	29.50 b
Imidan	140.70 a	21.65 b	1.00 c
Dylox	135.60 a	1.75 b	5.00 c
Metasystox R	136.05 a	4.90 b	.00 c
Dylox and Metasystox R	135.80 a	2.25 b	.35 c
Untreated	135.60 a	106.30 a	94.25 a
Test 3			
A-47171	38.45 a	8.45 b	13.50 bc
ABG-6070	38.95 a	11.15 b	51.15 b
Diazinon AG 500	38.45 a	6.65 b	6.90 c
Ficam W	43.95 a	10.65 b	28.75 bc
Imidan	38.75 a	5.30 b	.20 c
Untreated	38.75 a	35.40 a	118.80 a

1/ 0.5 tsp of Tween 20 added per gallon.

Table 41.--Carmine spider mites on lima bean

Treatment	Mites at postspray day-- 1	4
Malathion	45.65 a	47.25 b
Sumithion	49.05 a	37.60 b
Untreated	137.05 a	189.05 a

Table 42.--Carmine spider mites on lima bean

Treatment	Mites at prespray	Mites at postspray day-- 1	4	14
PP 557	69.55 b	6.75 b	17.05 b	8.25 b
SD 43775	100.50 b	2.70 b	13.20 b	6.55 b
Sumithion	79.25 b	3.55 b	42.75 b	18.00 b
Untreated	182.85 a	143.25 a	149.40 a	227.70 a

Table 43.--Carmine spider mites on lima bean

Treatment	Mites at prespray	Mites at postspray day-- 1	4	7
ABG-6070	36.30 a	16.50 b	24.45 b	30.75 b
Ficam W	60.80 a	10.55 b	6.45 b	6.25 b
FMC 33297	62.50 a	8.05 b	4.65 b	2.95 b
Imidan	46.75 a	3.45 b	2.45 b	1.80 b
SD 43775	67.10 a	7.25 b	6.15 b	2.45 b
Untreated	57.60 a	71.10 a	111.60 a	122.85 a

United States Department of Agriculture
Agricultural Research Service
Beltsville Agricultural Research Center-West
Beltsville, Maryland 20705